

TUBERCULOSIS

SAMACHAR

69/108

Dr. O. A. SARMA

B. Sc., M. B. B. S., M. D., T. D. D.,
F. C. C. P. (U. S. A.)

Professor and Deputy Superintendent,
Hospital for Diseases of Chest & TB
Hyderabad, A.P. 500 038.

DERABAD,

5-10-76

long period
osis & Chest
experiences
book. A work
bains-taking,
facts spread
insight into
public health
understanda-
rporated the
aspects of
eatment and
method of
conceptions
xperience in
ems encoun-
ers of this
is a selfless
health cons-
concerned.
rence value
workers and

n M
lin &

First Edition :
November, 1976.

Price : Rs. 5-00

Printed at :
Naga Lakshmi Art Printers
Basheerbagh, Hyderabad-29.

Dr. S. N. Mathur
Director of Medical Services

HYDERABAD,
15-10-76

I have known Dr. O.A. Sarma for a pretty long period working as a specialist in the field of Tuberculosis & Chest Diseases. He has condensed his rich and fruitful experiences over the course of 23 years, in the form of this book. A work of such nature is possible with a background of painstaking, hard working, patient and sincere recording of facts spread over a number of years. This book provides an insight into the problems in this disease, tuberculosis, a public health challenge. The book is written in an easy style understandable to the common man. The author has incorporated the fruits of his diligent observations in the various aspects of this disease viz. clinical features, recognition, treatment and preventive measures. Health education is one method of coming nearer the masses. Phobias and misconceptions about this disease have been nicely discussed; experience in narration of patients' symptoms and the problems encountered in day to day management of frustrated sufferers of this chronic disease have been well ventilated. This is a selfless service rendered by the author to promote the health consciousness of the lay public as far as this disease is concerned.

I am sure this book will be of immense reference value to students, paramedical personnel, basic health workers and public health administrators.

Sd/-

Dr. Shanti Narayan Mathur,
MBBS., MRCP (Edin & Ire)
FRCP., (Edin), FRCP (Ire)
FICS., MRCS..
(Director of Medical Services,) Govt. of Andhra Pradesh
HYDERABAD.

PREFACE

The aim of this book is to provide knowledge to the common man regarding the facets of health education in tuberculosis. The experiences and utterances of doctors in this field are usually high styled and beyond the comprehension and purview of the common man; it is my desire to disseminate the knowledge in an easily understandable style. During my efforts in the preceding 23 years observing the symptoms and evolution of the disease in many patients, I have gained this experience and I thought it fit to give the benefit of the same to other fellow-beings including students.

My grateful thanks are due to Dr. Shanti Narayan Mathur, Director of Medical Services, Government of Andhra Pradesh, Hyderabad for his kind message expressing a gesture of appreciation of this work.

I thank most sincerely my colleagues, particularly Dr. G.G. Padma Rao, for their unstinted cooperation in going through the manuscripts and proofs.

I acknowledge the help rendered by the authorities of T.B. Association of Andhra Pradesh, Hyderabad branch for lending the blocks of T.B. seals etc., which has added charm to this publication.

The author would like to express his regrets for any inadvertent mistakes either in the composition or printing.

I express my gratitude to Shri N. Chidambara Rao, Proprietor, Nagalaxmi Art Printers and his workers for printing this book in a short time.

Dr. O. A. SARMA

CONTENTS

	Page
Introduction	1
1. Chapter I Problem of Tuberculosis	5
2. " II Tuberculosis — its evolution	10
3. " III Study of the disease — Pathology of T.B.	20
4. " IV Symptoms of Tuberculosis	31
5. " V Recognition of the disease — Diagnosis	38
6. " VI Treatment of Tuberculosis	48
7. " VII Control of Tuberculosis	61

Fi
N

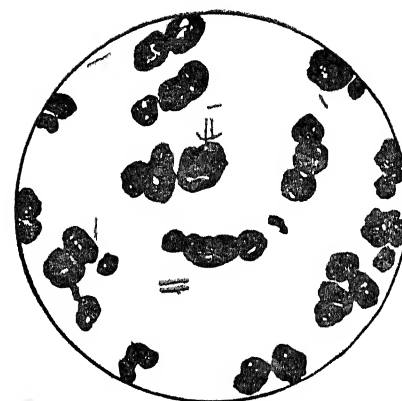


Fig. 1

The red looking objects are tubercle bacilli

Introduction

Tuberculosis is considered as a dangerous affliction in the lay public; it is thought of as an incurable disease, devastating the individual's body tissues and depleting his financial resources. It is not uncommon to express horror at the breakup of news that an individual is suffering from tuberculosis! There is no need for such an alarm. Times have changed for the better.

Tuberculosis need no longer be construed as a story of frustrated lives and shattered homes. The gloom has cleared now. The patient is not left helpless. The despair is unwarranted.

Consequent to the changes in the epidemiology of the disease which have occurred in the previous years, certain facts have emerged out giving reassurance to the sufferers of the disease. The management of the disease has been revolutionalised *pari passu* changing pattern and epidemiology.

Old ideas of exile to a sanatorium, sentence to bed rest and dumping the patient with eggs and milk to the detriment of the nutrition of the other members of the family in the house, have changed yielding place to newer methods of approach towards arrest of the disease. Patients are being treated in their own surroundings, at their homes. It is enough the patient is given a well

balanced diet ; there is no point gained in over-feeding him in a vain attempt to cure the disease.

The attitude of rehabilitation and change in occupation was hanging like a Democles's sword in the imagination of the patient in the past ; now-a-days the trend is to return him to his occupation. Clearance of the infection is achieved by fast acting drugs and hence there is no dread of spread of infection either in his house or in the community.

The factors producing this disease, its causation, bacteriology, pathology etc., have been studied in detail and carefully. The plans for its control have been outlined. Scientists have sacrificed their valuable time in the pursuit of knowledge about this disease and have enlisted their impressions and experiences to serve as guidelines to others. We are able to interpret the evolution of the disease process on scientific footing.

The age-long, tradition - bound and superstition-biased misconceptions about the disease pushing him into ill-fated circumstances, are proved to be wrong. Such emotional outbursts have no role in the present day concept of the disease. It has been established that tuberculosis is caused by a germ, the tubercle bacillus.

Certain phobias exist in the minds of masses about this disease. One such is that the disease is hereditary ! The answer to this query is an emphatic 'no'.

Next phobia is that it is incurable. It has to be emphasised that there is a treatment with success rate of over 90% in moderately advanced cases and nearly 100% in disease detected fresh in the initial early stages.

People need not get disheartened. This disease is to be considered as problematic to the population in general as it is to the patient in particular ; under such realisation only wherein the people in general feel themselves a part and parcel in the control programme, does the key to the solution exist. When a patient in a house is cured, the neighbours are protected ; if the neighbours are protected the village folk are not at risk. When the disease is controlled in villages, the panchayats, taluqs and ultimately the entire district, is protected against the disease.

It has been established on a national sample survey in our country that the extent of the problem is the same in rural areas as in urban surroundings. About 82% inhabit villages in our country ; hence 82% yield of tuberculosis cases in the entire community is achieved by combing out rural areas. Hitherto emphasis was laid on treating such of those urban folk ; hospitals & facilities were available in cities only. Proper attention was not paid to the patients in villages. The above mentioned National sample survey provided an eyeopener for the lapse in our measures so far adopted to control this disease. With this object in view, the National Tuberculosis Programme was envisaged ; the District TB Programme was implemented. In this setup, facilities for free drug distribution nearer the patients' homes have been developed which is the desired ideal ; but one caution, i. e. these medicines have to be used uninterruptedly for one and a half year.

There is an unimaginable hard task achieved by scientists in the pursuit of discovery of these medicines. Each tablet or injection will be first tried on animals like dog, guinea pig, mouse etc., and the effects on the organism evaluated. After

observing for tolerance by these animals, the dose of the drug will be determined. Subsequent to such careful and controlled trials only the drug will be released in the market for human consumption. After usage of the same, the bacilli in the body will be destroyed; even if all are not killed, they are made avirulent and get converted into harmless beings. Under these circumstances the patient has arrested and ultimately conquered his disease.

If the proper medicine is not used, the corollary is that the bacilli multiply in the tissues and lead to further destruction. Besides, these organisms excreted from the patient's body are infectious to other healthy contacts; thus the mode of transmission is set up. To avert this danger, the only solution is to get rid of tubercle bacilli in his body, making him non-infectious. With such a step, he poses no danger to himself as well as to the community at large.

Health education is a basic requirement of every citizen. Doctors, health workers and nurses ought to devote time for this task and see that the infected are benefited through health propaganda. Healthful ways of living should be propagated through radio talks, cinema (documentary films). Health bulletins have to be published in various languages in the country. Effective methods of health education must be discovered.

It is fruitful to drive into the minds of people the following: Find, treat and educate the sufferers in the community with the ultimate object of saving them, saving yourself, your family, your neighbours and in turn, safeguard the public health of the nation.

CHAPTER-I

Problem of Tuberculosis

Tuberculosis is a fairly widespread disease not only burdening the resources of families comprising of sufferers of the disease but also posing a challenge to maintenance of community health. Ours is one of the countries highly affected. It is estimated that 5 lakhs die of this disease annually, which works out 'a death a minute'. There are 8 to 10 million cases of tuberculosis, out of whom 20 to 25 lakhs are harbouring bacilli in their sputum i.e. the latter are capable of spreading the infection to others. The sputum of these patients abounds in droplets containing innumerable bacilli. The lungs are likened to loaded guns; the firing is by coughing. With each bout of cough showers of bacilli are discharged into the surroundings. Children fall an easy prey to this mode of infection viz., by inhalation.

Extent of the problem

A national sample survey was conducted in our country in 1955-56 which revealed that:

- 1) 13 to 25 out of 1000 persons were found to have 'active' and 'probably active' tuberculosis; out of which four were excreting bacilli in sputum.

- 2) The prevalence of the disease was same in villages as in cities.
- 3) In the age group 35 and above, prevalence in males was more than in females.
- 4) The prevalence is increasing as age is advancing, specially in males.
- 5) Prevalence was more in localities with insanitary conditions, in slums and poverty-stricken groups.
- 6) In 4 to 33% of cases, cavitation in lungs was found in x-ray of the patients.

The above information was gathered after a careful evaluation of various samples of population throughout the length and breadth of our country, from one nook and corner to the other; thus it represents a glimpse of the insight into the problem. The bacilli in sputum were found by microscopic examination.

Since the disease is prevalent to the same extent in villages as in cities, approach to the treatment and control must necessarily include rural population. In the District Tuberculosis Programme (D.T.P.) this rural folk is reached through a network of facilities linked with primary health centres, local fund dispensaries etc.

Bacteriology of tubercle bacilli

The tubercle bacillus is of the size 1 to 4 micron i.e. about $\frac{1}{8000}$ by $\frac{1}{80,000}$ of an inch. It has to be

observed under the microscope. (Fig. 1). These bacilli are coughed out in sputum in innumerable clusters. They inhabit the diseased parts in the body, for example lungs, bones, intestines, lymph glands etc, ever multiplying and thus perpetuating their progeny. They get excreted through sputum in lung tuberculosis, through sinuses in bone and joint TB, lymph node TB etc. This material is stained with chemicals, search for bacilli is made with the aid of microscope.

Next step is to grow these bacilli in artificial media containing eggs, potassium and magnesium salts (Lowenstein-Jensen medium). The bacilli establish colonies indicating their growth; such a procedure is termed culture of the bacilli.

These bacilli are of four types, human, bovine, avian and atypical. We are concerned with the human type in tuberculous infections in our country. The rest are insignificant and not problematic. More than 95 to 98% are infections by human type of bacilli.

Historical Review of Tuberculosis in some of its aspects

Tuberculosis, the white plague in the Nineteenth Century, the Captain of all the Men of Death hectic of all human afflictions, characterised by its ubiquitous presence not only in all parts of the globe but in all tissues of the human body reckons a challenge to masters of modern Medicine with an imposing array of baffling unsolved problems.

The tubercle bacillus has lived in symbiosis with man throughout the world, over a period dating back to 5000 B.C. as recorded in Egyptian mummies. The description of

diseases of elephants given in old Hindu literature indicate that tuberculosis was very frequent among the animals in India 2000 B.C. and earlier. Tuberculosis was described under the title "Rajayakshma" about 1500 B.C. in Rigveda (Book 10, hymn 161); earlier records occur in the laws of Manu in India 1300 B.C. That tuberculosis did exist in Egypt has been authentically proved by Smith and Ruffer, who described tubercular lesions of vertebrae, the typical Pott's disease in the body of a mummy (about 1000 B.C.).

In the writings of Hippocrates "The Father of Medicine" (462-377 B.C.) several references to this disease occur. Galen (129-200 A.D.) gives a detailed description of the different forms of the disease, alludes to the evidence of its infective nature and even suggests that the disease should be treated by milk diet and climatic therapy of sea voyage and high altitude.

Royal "touch" as a cure for "King's evil" under which scrofula came to be known was practised by English Kings (1500-1700). In England in 1684 there was an instance of trampling to death of a large number of persons in attempting to reach the hand of the king, in a fond hope of cure, of course. According to Boswell, Samuel Johnson was one of the scrofulous to be touched by Queen Anne in 1712; unfortunately he was not cured.

Between 3rd and 17th centuries there was little progress in the development of knowledge in tuberculosis.

With the significant epoch making discovery of the tubercle bacillus in 1882 by Robert Koch, a land mark in the "era of bacteriology" was established.

The epochal discovery of streptomycin in 1944 by Walksman, PAS in 1946 by Lehmann and the fortuitous discovery of the anti-tubercular effects of isonicotinic acid hydrazide in 1951, have marked the beginning of the true "chemotherapeutic era" in the fight against tuberculosis. With these drugs as the ones in the first line of defence, attempts are being made to add newer drugs in the therapeutic armamentarium.

The same fire which wastes the body in consumption also makes the mind shine with a brighter light. Greeks characterised this drive in a consumptive as 'spes phthisica'.

The slight toxemia stimulates the higher centres instead of depressing, enabling poets to compose more vividly, musicians sing more sweetly, statesmen to devote themselves more heroically to the good of their country. That this sweetness in the human life has put the classical halo around the head of the individual who in the language of the past, was described as having the phthisical diathesis, is borne by the testimony of the above anecdotes.

There were instances of poets, scientists, artists and such talented men with taste for fine arts having fallen into the clutches of this scourge, the white plague. Famous poets Goldsmith, Keats, Shelley and R.L. Stevenson, underwent the ordeal of the disease. Precious lives of Smt. Kamala Nehru, Ramanujam, the famous mathematician were lost in the battle against this disease.

CHAPTER-II

Tuberculosis - its evolution

Imagine tubercle bacillus to be a seed. Soil must exist for its implantation. The soil is the human tissue or organs. Disease is an outcome of the factors pertaining to these two living forces. Let us observe how these forces are acted upon in the human being.

Tubercle bacillus is the seed or parasite. Human tissue is the soil or host. Seed and soil factors determine the host parasite relationship. The factors pertaining to the seed are prevalence of infection, its virulence, potentiality for multiplication of the bacilli etc. Factors pertaining to the soil chiefly depend upon the body resistance. When the body resistance falls to a low level, say, as a result of debilitating diseases, the body falls a prey to this disease. To quote an instance, diabetes mellitus is one such disease in which the general resistance is lowered, tissues become susceptible to TB. Pulmonary TB spreads like wild fire in these diabetics; the situation is like availability of fuel to fire.

Following are some factors of the soil worth considering:

1. *Body constitution* : There is a widespread misconception amongst the lay public that tuberculosis is hereditary, that it is inherited in families. It has to be emphasised that it is not so. Tuberculosis does not run in families. If either

parent is a patient, the child is not born with TB. This is a fact.

There are instances wherein efforts in arranging matrimonial alliances, settled in various other aspects, have been scored out on this flimsy ground that either of the party is not willing to fulfill the contract because of history of TB in the family. Imagine the disappointment in the wake of such an abortive attempt in the negotiation of a matrimonial deal!

Certain features like height, colour and curls in the hair, colour of pupils in the eyes (black or grey), complexion etc. might be incorporated in the inherited traits. The individual is not responsible for the said characteristics exhibiting themselves after birth. Likewise, there is an entity called 'natural resistance' which the baby inherits from the mother by virtue of the presence of which it is protected against this disease immediately after birth. Subsequently, after entering this world he acquires or earns resistance, which is designated as 'acquired resistance'. As the child grows, the natural resistance declines while the acquired resistance gets enhanced, the latter gets accumulated to an increasingly progressive level so as to enable him maintain a state of good health to ward off further infections. A peculiar feature in this disease is that subminimal infections boost up the acquired resistance, but with the exception that there is always a dread of disease if the infection is caused by highly virulent bacilli, or when the infection is contracted during a stage of enfeebled body resistance. The above considerations lead one to the realisation of the importance of soil factors in the outcome of the disease.

2. Environmental factors

i) Financial situation: Poverty breeds TB, tuberculosis aggravates poverty. The availability of balanced food is upset in poverty, as such the tissues are liable for infection in this state of under-nutrition, in other words the soil becomes favourable for the implantation of the seed viz. the TB bacillus. During and immediately after the first World war the famine led to increase in incidence of TB. Hence in wartime, during famine, floods, drought, earthquakes and such stresses and strains in life the well-being of individuals is affected and incidence of TB is increased.

In a survey conducted in Delhi in 1968 the prevalence of TB in low-income group was found to be three times as much as that in the middle-income group. Thus a socio-economic factor is highlighted.

Ill-ventilated insanitary dwelling conditions representing the abode of poor people predispose to the increased prevalence of this disease. Added to this poverty, is the menace of non-observance of family planning. Measures of family planning, if adopted, bring down poverty. If poverty is brought down, TB prevalence is brought down.

ii) Tribals, lambadas and such primitive races when exposed to urban polluted atmosphere catch this disease very easily. They suffer from acute fulminating type of disease. The reason for this is the fact that their tissues have not got seasoned to the bacilli. The moment infection has set in, it spreads like wild fire producing devastating results. In contrast, city dwellers by virtue of their constant contact with infection (subminimal infections) develop increasing

degrees of acquired resistance against this disease and get protection.

It is frequently observed that these primitive races are being attracted to cities for livelihood. Their finances are too meagre to meet the exacting demands of cityliving—In that state of stress and strain they fall victims to this disease.

Occupation

iii) Such occupations involving working conditions in the immediate vicinity of the patient e. g. nursing profession is entailed with certain risk of infection. The profession of a barber is another such, in the sense, if the barber is a patient he will infect others, and if patients are attended to for the hairstyle the barber gets infected. The prevalence of TB is greater in factories and mines where silica is dealt with. One such is an occupational disease called silicosis, occurring in workers exposed to silica dust, Silico-tuberculosis is a notorious combination,

3. Hormonal factors

It has been stressed that the prevalence of TB is more amongst diabetics. Pancreas produces insulin which controls blood sugar. The blood sugar is increased in diabetes as a result of which sugar is excreted in the urine. Such a state of increase in blood sugar with resultant accumulation of sugar in tissues favours multiplication of tubercle bacilli since they thrive very well in the presence of sugar. More details about this disease are given in 6th chapter.

There are another set of important endocrine glands called adrenal glands which are situated on the top of kidneys. These glands secrete hormones which are essential

2 for maintenance of normal blood pressure, normal sugar in blood and such physiological adjustments in the body required in health. During a phase of excessive activity of these glands tubercle bacilli thrive and flare up foci of disease.

Some more host factors

Influence of other diseases

In diseases of stomach and subsequent to operations on it, nutrition is interfered with and susceptibility to TB is increased. In the same token, individuals suffering from malabsorption from the intestine are more prone to this disease as nutrition is affected.

Debilitating illnesses, convalescence from long-continued fevers, post-influenzal state predispose to disease or flare up of preexisting disease. In children particularly, measles, whooping cough and influenza are notorious forerunners of pulmonary TB. The difference between whooping cough and the cough of pulmonary TB might not be appreciated by the parent of the child; cough due to pulmonary TB might still be mistaken for the original whooping cough. Oftentimes, the features of tuberculous process might merge into those of the earlier whooping cough. Hence it is pertinent that the lay public become aware of such situations so as to take the child to a doctor for the necessary consultation.

Inmates of mental institutions, those upset with psychological abnormalities are in particular danger of developing pulmonary TB; its prevalence is found to be more in the emotionally unstable, worrying and frustrated type of individuals.

In addition to the factors mentioned above, some more are self explanatory. Excessive physical strain beyond ones capacity, fatigue, exhaustion, worry, emotional stress, inability to cope with vicissitudes in life (ups and downs) and lack of courage to face failure in life with subsequent reaction culminating in frustration shorten life expectancy, diminish enthusiasm and drive in life and predispose to development of TB.

Excessive indulgence in drinking toddy, liquor, alcohol etc., leads to devitalisation of tissues. On one hand he spends what all he earns for his drinks, on the other hand his tissues lose the power of defence to ward off infections. His family members are deprived of the support from the head of the family and untold miseries creep in. In such a situation it is no wonder TB sneaks in!

Thus so many conditions have been enumerated in the outcome of this disease.

Tuberculin or Mantoux testing

The yield of tuberculous patients will be more in those children who are tuberculin positive viz, in whom a swelling of the size of 10 millimetres or more is noticed after the testing. Details about this testing are given in 5th chapter.

Health-a balance

Health is a balance, factors pertaining to the bacilli viz. virulence etc., representing one pan, body resistance the other (Fig. 2). When these two forces are equal the balance is in a horizontal position i.e. in a neutral position. If the bacillary virulence is high the balance is tilted in its favour,

2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
98
100
102
104
106
108
110
112
114
116
118
120
122
124
126
128
130
132
134
136
138
140
142
144
146
148
150
152
154
156
158
160
162
164
166
168
170
172
174
176
178
180
182
184
186
188
190
192
194
196
198
200
202
204
206
208
210
212
214
216
218
220
222
224
226
228
230
232
234
236
238
240
242
244
246
248
250
252
254
256
258
260
262
264
266
268
270
272
274
276
278
280
282
284
286
288
290
292
294
296
298
300
302
304
306
308
310
312
314
316
318
320
322
324
326
328
330
332
334
336
338
340
342
344
346
348
350
352
354
356
358
360
362
364
366
368
370
372
374
376
378
380
382
384
386
388
390
392
394
396
398
400
402
404
406
408
410
412
414
416
418
420
422
424
426
428
430
432
434
436
438
440
442
444
446
448
450
452
454
456
458
460
462
464
466
468
470
472
474
476
478
480
482
484
486
488
490
492
494
496
498
500
502
504
506
508
510
512
514
516
518
520
522
524
526
528
530
532
534
536
538
540
542
544
546
548
550
552
554
556
558
560
562
564
566
568
570
572
574
576
578
580
582
584
586
588
590
592
594
596
598
600
602
604
606
608
610
612
614
616
618
620
622
624
626
628
630
632
634
636
638
640
642
644
646
648
650
652
654
656
658
660
662
664
666
668
670
672
674
676
678
680
682
684
686
688
690
692
694
696
698
700
702
704
706
708
710
712
714
716
718
720
722
724
726
728
730
732
734
736
738
740
742
744
746
748
750
752
754
756
758
760
762
764
766
768
770
772
774
776
778
780
782
784
786
788
790
792
794
796
798
800
802
804
806
808
810
812
814
816
818
820
822
824
826
828
830
832
834
836
838
840
842
844
846
848
850
852
854
856
858
860
862
864
866
868
870
872
874
876
878
880
882
884
886
888
890
892
894
896
898
900
902
904
906
908
910
912
914
916
918
920
922
924
926
928
930
932
934
936
938
940
942
944
946
948
950
952
954
956
958
960
962
964
966
968
970
972
974
976
978
980
982
984
986
988
990
992
994
996
998
1000

bacilli take upper hand. If the body resistance is kept at a high level the balance will tilt in a favourable direction; the body defences are mustered, body conquers the bacilli. It stands to reason then that the aim in health is to ensure that the tilt is in favour of body resistance thus safeguarding the individual.

Primary infection

First exposure to TB bacilli is different from disease as far as tuberculosis is concerned. Every child gets exposed to tuberculous infection after birth and it is profitable to get exposed at a favourable period in life, which is logically in the earlier years after birth when there is a cover of natural resistance derived from mother through inheritance. The situation in which the individual gets exposed to tuberculous infection for the first time after birth (first encounter with the bacilli) is described as primary infection.

Primary infection and progressive primary disease are two different clinical situations, the former occurs in all while all do not suffer from the latter. Some amongst the primarily infected individuals only evolve into progressive primary disease. Primary infection is usually unnoticed and uneventful while in progressive primary disease cough, fever, loss of appetite and such other symptoms manifest.

To know whether primary infection has occurred, tuberculin test must be performed. If the swelling is more than 10 m.m. in size, which it positive, it is a hallmark of primary infection having had occurred (more details in 5th chapter). A positive reaction indicates that the tissues are showing alertness, which state is desirable for the continued well-being of the child.

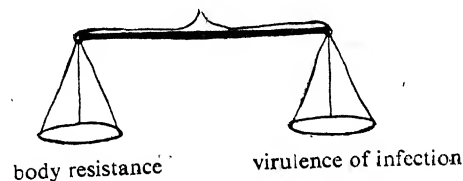
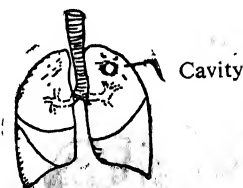
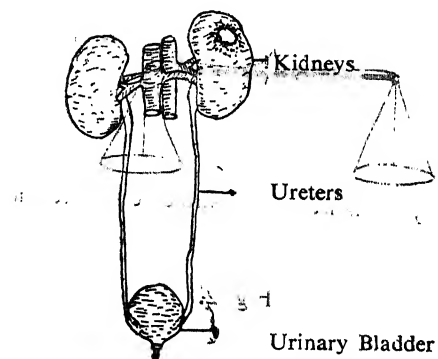


Fig. 2.

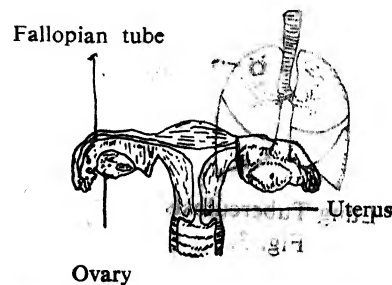


Lung Tuberculosis

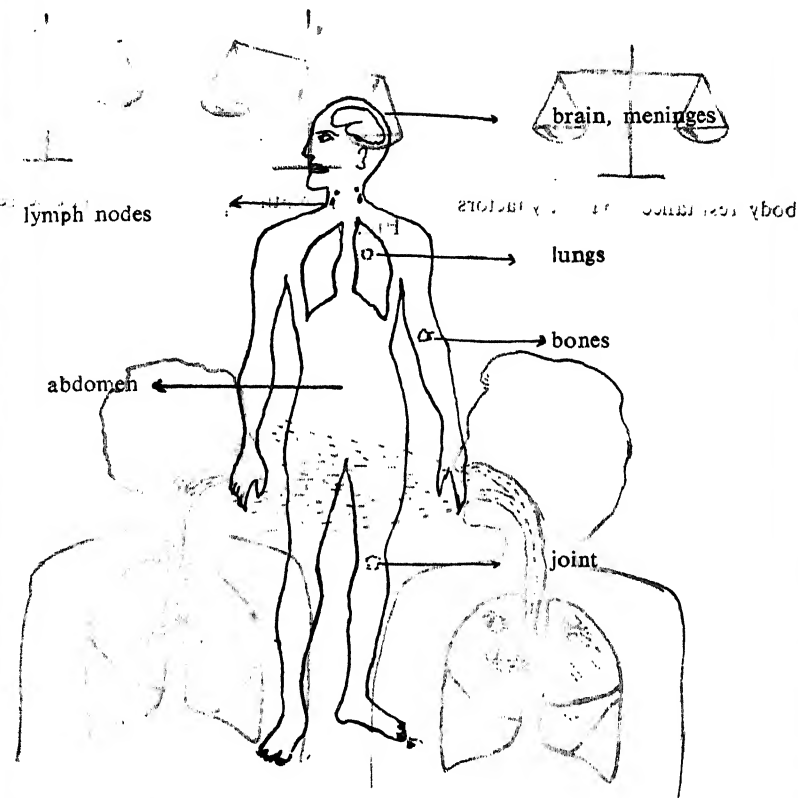
Fig. 3.



Kidneys — tuberculosis
Fig 4.

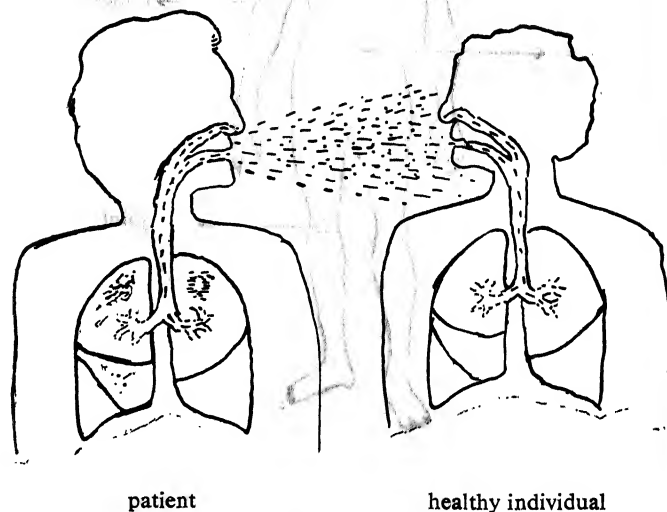
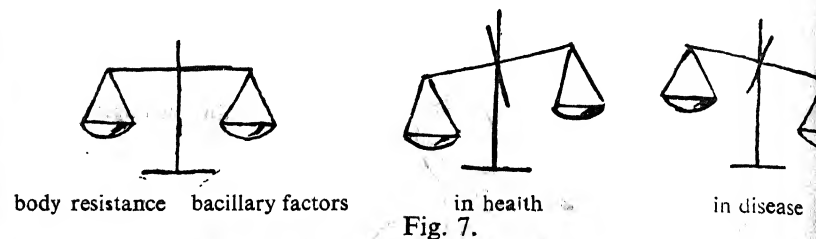


Tuberculosis of female reproductive organs
Fig. 5.



Tuberculosis can affect any part of the body

Fig. 6.



Infection through droplets of sputum

Fig. 8.

In those individuals in whom primary infection has occurred, the tissues develop resistance (power to ward off) against subsequent infections. The child develops this acquired resistance by virtue of the protection gained as a result of the initial (first or primary infection). This is a favourable and desirable state of affairs and trend of events.

In certain unfortunate children, the above favourable train of events might not ensue; progress and transformation of the first infection into frank disease hallmarks an unfavourable trend—such cases require treatment.

Vague general symptoms like failure to thrive, lack of appetite, low grade fever, loss of interest in surroundings and play, changes in the behaviour patterns of the child as observed by the mother, peevishness, irritability and such deviations from the normal wellbeing are spotted out in the initial stages of the disease. In some, night sweats often drench the clothes. It is the prerogative of a child to gain weight month by month; on the other hand the child afflicted with tuberculosis tends to lose weight.

The “initial” fever also called the “fever of onset” of the disease gradually assumes more and more recognisable rise in degrees and it may exhibit continuous or irregular rhythm. At this stage ‘typhoid’ is the favourite diagnosis of the lay public as well as the nondescript.

TB in Children

Examination of the contacts of the child is an important component of TB control programme to detect the sources of infection and check its spread.

The following instances are considered in the contact examination :

1. Contacts in the house: mother, father, siblings, grand-parent in the house who is alleged to have been supposedly suffering from asthma for number of years, but in reality might be a case of TB. The grandparent has a callous attitude towards getting himself/herself investigated because of loss of interest in surroundings and life, uncertainty in longevity culminating in a feeling of social unwantedness and consequent aversion to subject himself/herself for physical check up of ailments. The 'ayah', servant, cook or gardner in the house might be an undisclosed contact.
2. A relative/uncle patient who visited the house and coughed over the child or conveyed infection through kissing and fondling the child.
3. A known or unknown patient during the phase of infectivity might be a neighbour.
4. Contact during bus-riding, public conveyances, or through school teacher.
5. Atmospheric pollution, vitiated air in thickly packed crowded places of amusement and entertainment, specially in a closed environment devoid of efficient exhaust systems. The dried road dust is more harmful than wet sputum. Indiscriminate spitting of 'pan' (betel leaf chewing) by infected individuals on roads, wall posters, electric and telegraph poles etc, is a potent way of spreading infection. In view of the child's height being too close to the surface of

these infected areas, the chances for infection are too obvious.

6. Children get infected through unhygienic ways of living like putting infected articles in the mouth, after picking them up from the floor.

7. Contamination of food stuffs and eatables with infected droplets. Spread of TB with milk is fortunately rare in our country since milk is boiled before consuming; bovine TB is not a problem in our country.

Post primary disease :

This is the disease developing not as an immediate prolongation of primary infection but occurring after the primary infection. When we describe tuberculosis in later life, this is the variety referred to.

CHAPTER-III

Study of the disease-**Pathology of T. B.***Tuberculosis of lungs*

As the bacilli are inhaled deep into the lungs, they are carried to the remotest parts of the lung called alveoli which are air containing sacs. The white blood corpuscles and other protective cells get ready to fight the invaders. A substance containing blood corpuscles, bacillary bodies and their products, and pus fills the alveoli. This is described as an exudate. This process of exudation spreads to the surrounding alveoli thus increasing the area effected. At this stage, the process of erosion may involve blood vessels, as a result of which blood streaks in sputum are noticed.

When the alveoli are affected, the change in the lung is described as bronchopneumonia. Infiltration is the word used when foci of disease are seen cropping up in the substance of the lung.

The lungs feel spongy in normal healthy individuals. In a stage in this disease, the spongy lung gets hardened and gives the feel of pressing a tuber. Such a process is called consolidation.

As the disease process advances, the part affected gets transformed into a cheesy material; this change is called caseation. This caseated material along with the lung substance which is destroyed and liquefied is thrown out of lungs by way of cough in the form of sputum. Hence cough is a mechanism by which this unwanted material is disposed off from the lungs through the tubes viz, bronchi and trachea (tubes through which air passes in and out of the chest). Consequent on the material being ejected out, a vacant space is left in the lung which is called a 'cavity in the lung' (Fig. 3). Bacilli thrive, multiply and propagate in this cavity. Soon this vacant space gets lined by a cavity wall which is visualised in the x-ray of chest in a patient suffering from TB of lungs.

The body does not keep quiet in this encounter with the disease. A reaction on the part of the body to arrest the invader is development of a hard tissue called fibrosis. is comparable to Fibrosis strengthening a breach with cement concrete. This vacant space in the lung is ultimately obliterated by fibrosis.

Fibrosis is the specific tissue reaction on the part of the body to fight tuberculous infection in whichever organ it be. The first and commonest cause of fibrosed lesion is tuberculosis in our country. When tuberculosis affects intestines, they are in turn, fibrosed and constricted. Tuberculosis of bones and joints leads to stiffness of the joint which is termed fibrous ankylosis. Thus fibrosis is a fort wall built in a battlefield in the encounter against the bacilli.

The infected material in the cavity in the lung spills over to other portions of the lung on the same or opposite side, thus setting up fresh foci of disease. Besides, the neighbour-

ring blood vessels are ruptured during the process of erosion by the cavity resulting in dangerous bleeding from lungs (called haemoptysis). This symptom is one of the most dreaded ones in the evolution of pulmonary T.B. In case treatment is started early, the cavity will be closed just like getting the walls of a balloon into apposition thus collapsing it; a linear scar will be left in the area previously occupied by the cavity. Thus a cavity could be obliterated with minimal or no fibrosis. If the above mentioned favourable turn is not noticed and if the cavity persists longer, fibrosis and thick wall for the same develop, when the chances of its obliteration are remote.

The cavity may become bigger producing more breathlessness in the patient. When the cavity bursts, the membrane covering the lung which is called pleura may get affected with the disease. Furthermore, the contents of the cavity trickle into the pleural space which is a potential space. The air in the lung may accumulate into the pleural space producing what is called a tension pneumothorax. This latter condition is a sequel to rupture of the cavity and bursting of the lung. If the patient is not shifted to a hospital as emergency, death may result.

Such a cavity may be a single one or there may be multiple cavities. The size may vary from few centimeters to few inches. The bigger the size, the problematic it is for management. There is greater chance for smaller cavities to get closed. Larger sized cavities tend to develop thick fibrotic walls, the evolution of which is difficult to predict.

These cavities might be present in one lung or both the lungs. If there is a bilateral cavitation with fibrosis, patient

will have excessive cough, sputum and breathlessness. Fibrosis hardens the lung, circulation of blood inside the lung is interfered and ultimately the heart gets affected. When the heart is involved secondary to lung disease, it is termed cor pulmonale. In health, heart and lungs are synergistic in their function. When the cardio-respiratory interrelationship is disturbed, the physiological needs of oxygenation of blood and tissues are not met; breathlessness ensues, swelling of the body with pitting over legs makes its appearance and the condition of the patient worsens.

There are some more drawbacks with this cavitation. In this situation, the bacilli multiply in the cavitary wall, establish their abode firmly there and colonise to other parts of the same lung or opposite lung. The two lungs are joined by the windpipes (bronchi and trachea). These act as channels for transmission of the infected secretions contained in the cavity. Further these cavities are easily attacked by other respiratory infections besides being perpetuators of tuberculous infection. Under these circumstances, antibiotics in addition to anti-tuberculous drugs have to be employed in the treatment of such patients.

Nodular tuberculosis :

Both the lungs might be occupied by nodules of size varying from few millimeters to few centimeters.

Miliary tuberculosis :

Another variety is one wherein both the lungs and other organs are studded with 1 to 2 mm sized (pin head size) mottled foci of disease. This type of TB is produced as a result of spread of the disease through blood stream into all the organs. Liver, spleen, bone-marrow, meninges (covering over the brain) and any organ may be affected. This variety

is called miliary tuberculosis. On examination of the x-ray of the chest in this disease one can make out the 1 to 2 mm pin head sized mottled shadows standing out as opacities. The disease involving the coverings over the brain (meninges) is called TB meningitis.

Tuberculosis of larynx (voice-box)

The infective bacilli laden sputum on coming into contact with the voice box (larynx) which is at the upper part of the windpipe (trachea) produces disease in that organ. As a result ulcers develop. In this situation the patient's voice is affected; hoarseness of voice and speech is noted. This disease is called TB laryngitis.

Tuberculosis of abdomen, intestines

When the bacilli rich sputum is swallowed, ulcers develop in the throat (pharynx) and food tube (oesophagus) which give rise to pain in swallowing. As it goes down, intestines are affected. The infective sputum containing myriads of bacilli, when swallowed, produce ulceration in the soft inner-lining (mucous membrane) of the intestine. These ulcers go on enlarging, producing more havoc. Patient complains of pain in abdomen, gurgling in intestines, diarrhoea and a state of non-absorption of nutritive products in the food (malabsorption syndrome); in its wake, nutrition is interfered with, loss of weight and emaciation results. Fever, lack of appetite, weakness still lower the general condition of the patient. These ulcers form around the inner surface of the intestine. When fibrosis occurs in these ulcers, the intestine is constricted at that region producing what is known as intestinal obstruction. When the intestine is thus tied down by fibrosed annular ulcers, normal waves of intestinal movement

(peristalsis) are hindered, unbearable pain in abdomen with vomitings lead to a medical emergency.

Diarrhoea, loss in appetite, lack of nutrition lead to emaciation ultimately producing bloodlessness (anaemia). At this stage body, lips, palate, inside of eyelids, palms and soles become pale. Swelling of the body is noticed, craters occur on pitting over the legs with fingers. This is called pitting oedema over legs.

There is a membrane lining the inside of the abdominal cavity called peritoneum, the affection of which with tuberculosis is called TB peritonitis. Fluid accumulates in the abdomen (ascites). The abdomen enlarges in size, gets tense, the patient cannot move; he gets breathless. Breathlessness and swelling of body are produced by the coexisting bloodlessness (anaemia) too.

When the abdomen gets affected with TB, in addition to the peritoneum or intestines, lymph nodes may be involved. When they are enlarged due to disease, they can be felt per abdomen. The patient complains of pain in the abdomen.

The other organs situated in the abdomen are also liable to be infected, the tuberculous infection having had spread through blood stream. It is logical to infer that since each and every tissue and cell in the body is drenched in blood, no wonder any organ can get infected!

Tuberculosis of kidneys

Kidneys can get diseased by tuberculosis. The kidney flesh gets transformed into a cheese like caseated material

which is excreted along the urinary tract in the urine. Kidney substance gets destroyed, cavity forms and fibrosis starts (Fig 4). Patient complains of pain in the loin along with fever and chills. In normal health, urine being a watery fluid flows very freely in the urine tubes (ureters). But the urine laden with cheese like flakes predisposes to hindrance in the free flow along the tubes. As these flakes obstruct the flow in the ureters, colicky pain is produced in the loin during their passage. When the tube is obstructed due to improper flushing inside by regular stream-like flow of urine, the portion above the level of obstruction gets dilated. This produces a condition called hydroureter or hydronephrosis.

The infected urine enters the urinary bladder and produces ulceration of its inner smooth lining (mucous membrane). As the ulcers heal fibrosis is produced, as a result of which there will be shrinkage of the organ. The bladder which thus gets shrunk loses the capacity to store urine and consequently the patient is obliged to pass urine frequently. This condition is called tuberculous cystitis. In this situation, the patient complains of burning sensation in urine, fever and rigors. The contracted organ is described as thimble bladder. When the fibrosed bladder refuses to receive urine from the ureters, they dilate due to stagnation of urine, which again leads to further aggravation of hydroureter.

Tuberculosis of reproductive organs :

In the female :

In females the reproductive organs could be affected. Ovary is the organ from which the ovum is generated. This

Ovum travels along Fallopian tubes to reach the womb (Uterus) (Fig 5). Any of these structures tend to be involved in TB of this system.

In the male :

From the urinary bladder infection may spread through vas deferens to the seminal vesicles, which are the storage organs for semen. The semen may contain infected caseated material. A gland called prostate which is situated around the urinary tract below the bladder is liable to get infected. The testicles and the tubes emanating from them (epididymis) can get affected, holes to the outside (sinuses) provide a way for the destroyed material to be eliminated. Thus such patients are seen with either swelling of testicles or sinuses.

Tuberculosis of bones and joints :

Bones and joints are the target sites, sometimes. The infection spreads to these sites by blood stream. The soft inner part of the bone (marrow) gets transformed into a caseated substance; during the process of its elimination to outside, it burrows into the hard outer core of the bone and presents itself as an opening (sinus). This is comparable to a tunnel in a hard rock. The mighty strength of this tiny bacillus is appreciated by its prowess to tunnel a hard tissue like bone! These sinuses discharging caseated material and pus exuding from inside are characteristic of bone and joint TB.

The same process involves the joints. In this affliction, sinuses are seen in the vicinity of joint. Sometimes the joint may get swollen with accumulation of fluid inside (TB

synovitis). At any time in the evolution of the disease, this fluid may come out through sinuses, or in favourable cases it may get absorbed with treatment.

T. B. of spine

The bones in the back (spinal column) are arranged in the form of beads in a string. The beads are the bones (vertebrae) and the string inside is the spinal cord. The spinal cord is a collection of nervous pathways transmitting impulses from the brain to the periphery (muscles) etc.) and receiving sensory impulses from the periphery to the brain. Thus is a vital live wire in the body. When the vertebral bones are diseased they crumble, the vertebral column yields showing a bend in that area. Consequent on this disfiguration of the vertebral column, the spinal cord is compressed. Another method of compression is by a collection of the caseated debris from the vertebral bodies, called a cold abscess. Or, sometimes the blood vessels supplying this vital live wire are obliterated. Whatever the mechanism be, the ultimate end result is that the vital live wire (spinal cord) is put out of its normal function and activity. It fails to conduct the impulses, already described above. When the spinal cord is affected at the level of the neck, all four limbs will be paralysed; if the site of involvement is at the level of the back of chest, the two lower limbs will be paralysed. Behold how disastrous the consequences are! This disease of bones is called T B spine.

Amongst the joints hip, knee, elbow, wrist, ankle and shoulder are involved; The small bones and joints in the hands and foot are affected rarely.

Tuberculosis of lymph nodes

The lymph nodes (glands) around the neck are usually enlarged in tuberculosis. It is a common sight to children going about with sinuses in the neck discharging the caseated material and pus. When the flesh in the lymph node gets diseased, it forms into a jelly like substance comparable to flakes of curds, which has already been described in other sites as cheesy caseated material, a characteristic tissue reaction in tuberculosis, whatever be the affected organ. Fibrosis starts at the region of these sinuses; puckered scars reminiscent of the disease are the sequela. The neck glands are the most commonly affected ones. At times, lymph nodes in the axilla or groin might be the seat of this disease.

Tuberculosis of Skin

The lymph node tuberculosis may not stop short there but it may invade the skin and thus make the latter also diseased. Besides the five senses, skin alone stands as the sixth sense! This covering viz skin hides the mystery of the inner organs by concealing them, keeps them safe, regulates warmth and moisture in the body and excretes unwanted products including salt in sweat. Such is the service rendered by skin to *homo sapiens*; even such a benefactor of the body has not been spared by tuberculosis.

When the overlying skin with lymph nodes underneath ulcerates, the condition is described as scrofuloderma (King's evil). Ulcers develop on the skin causing disgust to the sufferer; these are covered with apple jelly like nodules (Lupus vulgaris). There are different varieties of skin tuberculosis.

Tuberculosis of eye, ear:—

The membrane covering the eye ball called conjunctiva can get invaded with TB, inflammation of which is described as conjunctivitis. The inner parts of the eye also could be affected. Chronic discharge in the ear especially in a patient suffering from long standing lung TB, may point to the fact that infection has spread to the ear (otitis media); this is rare.

TB of pericardium :

Pericardium is a membrane covering the heart. Under certain conditions this may be inflamed by tuberculosis or fluid may accumulate in the membrane (TB pericarditis or effusion) resulting in interference to the normal physiological function of the heart.

On perusing the above information it is clear that considering the fierceness of this infection, any organ in the body could be invaded with the disease process (Fig.6). The organ involved degenerates commensurate to the virulence of the disease; the function of that organ is upset. Since it consumes the tissues it is called consumption; as it is a progressive wasting disease it is called phthisis—both are synonyms of tuberculosis.

CHAPTER-IV

Symptoms of Tuberculosis

Important episodes in the evolution of the disease, symptoms narrated by the patient, examination of his lungs and other organs — all these aid in diagnosis; the details in each will be dealt with.

History of the disease. How and when the disease started, what were the symptoms at the commencement and what change were noted in the symptoms with time, previous medicines used and attendance to hospitals—all these have to be noted down.

In adults preceding attack of influenza, long continued fever or any debilitating and devitalising disease and running down in the general condition of the patient have to be asked for, in careful detail. In children whooping cough, measles and such acute exanthemata, influenza are notorious forerunners of tuberculosis. Hence particular care is to be taken in eliciting such information. Under conditions of psychological and emotional upsets, mental worry, agitation and anxiety, circumstances leading to fatigue and exhaustion, stress and strain in life and deficiency of nutritive value in food taken (protein deficiency chiefly), the general resistance of the body is lowered and it falls a victim to this disease.

In females of child bearing age say 20—40 years, there is maximum strain and stress on the individual since she has

to cater to the domestic responsibilities in addition to child bearing and child rearing. It is no wonder that under such exigency of circumstances body becomes vulnerable for infection. It is not an uncommon experience for doctors to note that tuberculous disease either may get reactivated or start *de novo* after delivery. Oftentimes, these patients are referred from Maternity hospitals as cases of long continued or problematic fever. The post-delivery period is a trying one for the woman.

Women in the child bearing age require special care during antenatal period — timely food and sleep, undisturbed surroundings, relaxation of body and mind. Health is upset with an imbalance of the above essential requirements. Repeated deliveries in quick succession, in violation of the tenets of family planning naturally lead to dwindling of general health. The pregnant mother cannot cope up with her own personal needs, besides fulfilling the family obligations and encountering stresses and strains of daily life. Under these circumstances she is prone to this disease.

The following changes in the daily life and routine of an individual raise the suspicion of tuberculosis having sneaked into the body; weakness, tiredness, fatigue and exhaustion even after slight work lack of energy, lack of enthusiasm and drive in life, irritability, emotional upsets disinclination to work more in his occupation and aim to prove himself more worthy of admiration.

Suspicious signals of the disease.

1. Loss of energy which is *unaccountable*.
2. Lack of appetite or impaired appetite, vague pain in abdomen, indigestion, inability to eat due to distaste

in mouth viz., aversion to food, and similar disorders pertaining to stomach or abdomen.

3. Nervous debility, exhaustion, lassitude, worry.
4. Disturbances related to heart and circulation, palpitation which means the subjective feeling of the beating of the heart, increase in the pulse rate when counted per minute, shortness of breath on slight exertion and hot flushes in the body.
5. Frequent colds and coughs. Before one attack of cold subsides, he is attacked by another one — cold in the upper respiratory tract descending down into lower respiratory tract thus producing the so called 'chest colds' and these too, very frequently. Ultimately symptoms of one cold may sneak into those of tuberculosis.
6. Irritation inside the throat, constant desire to clear the throat but with an attempt in vain, hoarseness in voice, uncontrollable dry cough.

Gradually along with the above deviations from the normal, fever sets in. Patient may express feverishness in the beginning viz., the sensation of feeling of inner warmth in the body might not be evident by rise in temperature when recorded by the thermometer. As the disease process advances, the fever increases in severity. Fever might be experienced in the evenings say from 3 to 4 p.m. till night or it may continue throughout the night and is usually accompanied by chills or sweats which are characteristically described as 'night sweats'. The bed clothes will get drenched with the night sweats, forcing the individual to change them dur-

ing night. It is not uncommon for patients to describe the fever as typhoid fever, by which they mean long continued fever; true typhoid (enteric fever) is a different entity altogether.

Along with the fever cough starts. In some individuals cough is the first symptom to be noticed and fever might ensue. Cough, though dry to start with, becomes associated with varying amount of sputum (which is the secretion obtained after coughing). In the initial stages this cough might be attributed to the increase in the habit of smoking or the already accustomed 'smokers' cough' in such of those habituated to smoking. Just like habit is second nature, cough becomes a part of their habit. The individual might not appreciate the difference between smokers' cough and the cough produced by tuberculous disease, thus camouflaging the true situation. Another turn of events is that the 'smokers' cough' has gradually merged with the cough produced by tuberculosis.

In the initial stages in TB the sputum consists of whitish flakes; as the disease advances it might turn yellowish or greenish. As a result of the destruction of the lung substance it is transformed into a caseated material resembling stale cheese. This material which is coughed out is called sputum. It has to be differentiated from saliva, which is a secretion in the mouth. Saliva is watery, while sputum is cheese-like, resembling curd-like flakes.

Associated with this cough and sputum, blood streaks appear in the sputum. Appearance of blood in sputum (haemoptysis) is a chief symptom in lung tuberculosis. If the amount of blood lost is considerable, fatal outcome is inevitable. Hence this is a dangerous complication which

naturally raises alarm in the patient's mind and compels him to go to the doctor for diagnosis. A complacent attitude in such cases is highly undesirable and unwarranted.

Increase in the pulse rate when counted per minute, rise in body temperature as recorded by the thermometer, heaviness in the body, pains in limbs, flushing in hands, palms, feet and other parts of the body, burning sensation in eyes and such constitutional symptoms form part of the narration. Pain in chest and shoulder girdle muscles, loss in weight, patient getting emaciated indicate progression of disease in the body. As a sequel of the emaciation it is logical to understand that the patient's garments are getting loose day by day. The above mentioned changes are worth noting in the evaluation of the severity of disease.

Other features

Along with the above symptoms, patient may complain of pain on either side of chest or in the entire chest. When the pain increases on deep breathing, it is an indication that the pleura, a membrane covering the lung is involved. Inflammation of the pleura is termed 'pleurisy'. The pleura is a membrane which closely invests the entire lung just like a pillow cover clothes the pillow. At times, the space in between the lung and the membrane which is a potential one may be the site of fluid formation; such a disease is called 'pleural effusion'. In this situation, the patient complains of breathlessness. Unless the offending fluid is removed, discomfort is not relieved.

Disease involving the covering over the brain (TB meningitis)

This disease is of serious import specially in children.

Fever, vomitings, headache, lassitude, photophobia (disinclination to see light), fits, paralysis of limbs, paralysis of eye muscles and consequent deficient eye ball movements and such neurological abnormalities are features in this disease. Deepening unconsciousness heralds progression of the process.

Some sequelae in children are increase in the size of the skull (hydrocephalus), paralyses, blindness, dumbness, mental deficiency or idiocy.

Disease of intestines, abdomen.

Fever, loss in appetite, vomitings, distension and pain in abdomen, diarrhoea, emaciation, swelling of body and such features already referred to in 3rd chapter.

Disease of kidneys.

Frequency of urination, burning and smarting on passing urine, back pain, blood in urine, colicky pain in loins and abdomen point to the disease.

Disease of reproductive organs.

In females: When the tubes carrying the ovum (Fallopian tubes) are involved it is called TB salpingitis. Patient complains of pain in lower abdomen, colicky at times and backache. Sleep is disturbed and the thought of food is repulsive on account of pain. Menstruation is altered or stopped altogether when the womb (uterus) is the seat of disease. White discharge (leucorrhoea) is a frequent complaint.

When ovary is involved, the production of ovum itself

is interfered with; in TB salpingitis there is hindrance to the travel of the ovum – the result of these diseases is sterility. Hence tuberculosis of reproductive organs in women is one of the chief causes of inability to beget children.

In males: mention in 3rd chapter

It has been detailed in this and the preceding chapter how the features of disease affecting the other organs in the body manifest themselves.

CHAPTER-V

Recognition of the disease — Diagnosis

Laboratory is the place where diagnosis is established. In lung TB, sputum should be coughed out and given for examination. Sputum is the material obtained after coughing when the destroyed matter and secretions in the lung are ejected out through the wind pipes, bronchi and trachea; from these tubes, the material is transported to the throat (pharynx) wherefrom it is thrown out as sputum.

Sputum Examination

Tubercle bacilli are detected on examination of sputum. This statement is easily made rather than put into practice. In some individuals it is a Herculean task to obtain a sample for examination. Sputum is a secretion which is considered unwholesome and hence disliked. Yet, as long as it is in the mouth no one expresses this, when once it is discarded it is hated! This sort of hostile attitude towards sputum is not correct.

When the patient is advised to get sputum for examination after collecting in a bottle with closed lid, a negativistic attitude is noticed at times, the patient replying 'I do not get

sputum' but at the same time swallowing it. He does not realise that he is coughing out sputum but swallowing the same. Some people give saliva instead of sputum; unless this saliva gets mixed with sputum, the bacilli cannot be detected. Hence the patient's have to be instructed not to give saliva (which is a watery secretion in the mouth) but to cough and bring out a sample of sputum. Women feel shy of bringing out sputum thinking that such an act outwits their modesty. Children cannot understand and may spit saliva only. Stubborn non-cooperatives do not cooperate.

The following advice is to be given to such of those individuals telling us that they do not bring forth sputum. They are fruitfully instructed to observe themselves bringing out sputum early in the morning first on waking up, after food or hot drink like tea, coffee, Horlicks. They should be convinced that it is a common observation both in some normal individuals as well as patients. The sputum thus raised must be collected in a bottle with a firm lid for example, 'snow bottle or Pond's cream bottle'. The bottle should be kept ready by the side to be utilised whenever sputum is brought forth.

The early morning specimen or the sputum collected overnight is preferably sent to the laboratory. The sputum raised on coughing in front of the examiner and supplied is called 'spot collection'. The bacilli may be detected in any one of these specimens.

Another method is to withdraw gastric secretion through a rubber tube (called Ryle's tube) in the early morning as the first act after waking up and examine the same for tubercle bacilli. This method will enable the doctors to detect the bacilli swallowed in the sputum; this procedure is specially

suited to women and children and such of those individuals who cannot raise the sputum but on the other hand swallow it.

The sputum so collected is stained with chemicals in the laboratory and the bacilli observed under the microscope, which is an instrument with a high magnifying power; the minute bacilli are magnified and made visible.

In case these bacilli are not seen by the above methods, an elaborate technique of growing the bacilli on a medium containing the nutritious products essential for their growth is employed. Such a technique is termed 'culture'. When the sputum is inoculated on this medium, the bacilli contained in the specimen set up their abode (colonies) on the surface of the medium, each colony measuring roughly about 1 to 3 mm in size; these colonies, in turn, harbour innumerable clusters of bacilli.

Blood examination and Mantoux otherwise called tuberculin test aid in the diagnosis of the disease.

Mantoux test (Tuberculin test): Tuberculin is a solution obtained by grinding the bacilli and thus extracting the bacillary products. This is supplied from B. C. G. Vaccine laboratory, Guindy, Madras. The solution must be fresh at the time of usage; to ensure that, it is flown by air. 0.1 ml. of this solution is injected into the skin on the front of the forearm. A weal of about 6 to 10 millimetres occurs, which in about 15 to 20 minutes subsides. 48 hours later redness appears at the site of injection. The redness is noticed in a well discernible way upto 72 hours and later fades away. The size of this redness is expressed in millimetres as measured at any time between 48 to 72 hours.

If the extent is more than 10 mm. the result is pronounced as Mantoux positive or tuberculin positive. The inference is that the individual has been infected with tubercle bacilli already; nothing more, nothing less. One cannot rush to a conclusion of the presence of disease. Mantoux test is positive in healthy individuals also. At times, this test is hyperpositive viz. shows a size of about 30 to 40 mm., becomes haemorrhagic, swollen and may evolve into blister in certain forms of tuberculosis, for example, pleural effusion in which condition fluid accumulates, in the pleura. a membrane covering the lung. Such patients are described as tuberculin hyperreactors.

In certain forms of tuberculosis like TB meningitis (inflammation of the meninges, the membrane over the brain) and miliary TB wherein the organs are studded with 1 to 2 mm sized (pin head size) nodules, Mantoux test may be negative in spite of the presence of disease, though advanced.

Tuberculin test helps in diagnosis of TB, more so in children. An indication of this disease in the latter is substantiated by a positive tuberculin test. If the test is negative, the presence of TB is unlikely; yet it is safe to get this fact ascertained.

X ray examination

X-ray photo is a sensitive test these days in this field of tuberculosis. This is also an aid to diagnosis but no one should conclude tuberculosis on seeing the x-ray photo alone. In the x-ray one may find scars, nodules, cavity, lymph node enlargement etc., the membrane covering the lung may be affected with fluid formation. Such changes are encounter-

ed not only in TB but in other diseases involving the organs in the chest.

There are instances wherein individuals are subjected to unwarranted treatment on the conclusion of tuberculosis with x-ray photo, alone. It is to be emphasised that sputum examination is more valuable, easy and cheaper than x-ray photo. Sputum examination is conducted by a simple and far less expensive instrument—the microscope. The microscope should not be looked down upon but it is profitable to look into it! It can be purchased for about Rs. 1,500/- to Rs. 2000/-. It is not difficult to equip this instrument in any primary health centre, local fund dispensary or with a rural medical practitioner. When compared to this investment x-ray machine costs 50 to 60 thousand rupees or even more. Workers have to be employed to run it, maintenance and working costs are high. Electricity, films and solutions for developing and fixing the films require additional expenditure. Work will be interrupted in times of electricity failure. Moreover, the machine is liable for breakdown and repairs during which period x-ray work is automatically suspended. Hence disappointments are unavoidable, if all trust is placed in the machine.

X-ray Vs. Sputum Examination

Examination of sputum with a microscope is possible with the services of one person, the technician. The establishment of diagnosis takes about 30 minutes. One must wait for the result of x-ray photo since the film has to be dried and then only read. Patient has to come next day for the report. Even then, x-ray is after all a shadow cast of the body, presence of bacilli in secretions is a proof of disease.

If bacilli are not found in sputum or secretions, x-ray photo is a more sophisticated step in the diagnosis. Sputum examination has been given the pride of place with priority in District TB programme.

Furthermore, if bacilli are not excreted from the sputum, there is no dread that this disease would spread to others; powerful medicines are not required to control such disease. On the other hand, the sputum positive patients should receive priority in the struggle to eradicate bacilli in them, which is the existing practice too, in the District TB programme. All specialist attention and care have to be bestowed to these infectious (otherwise called positive) cases.

The result of sputum examination should not be pronounced as negative with one attempt only. Examination must be repeated on three consecutive days; in the wake of a negative result, the search for bacilli must continue after that period too.

There are different sizes in x-ray photos; big size 14" x 12", small size 10" x 8"; A miniature X-ray photo called Odelca 70 mm. ie. 7 cm. by 10 cm. is another in use.

Sometimes a special medicine, Dionosil is instilled into the wind pipes (trachea & bronchi) through a rubber tube passed into the trachea and x-ray photo is taken to study the details of the tracheo-bronchial tree. This procedure is called bronchography and the x-ray picture obtained is termed bronchogram.

Further methods

Besides the above, in some cases a tube called bronchoscope is inserted into the trachea and the inner aspect of wind pipes visualised, which procedure is named bronchoscopy.

When the disease is presenting as an enlargement of lymph nodes or as an opening into the skin (sinus), such diseased tissue is cut and examined for evidences of tuberculous changes. This procedure is another accepted method in diagnosis and it is called biopsy of tissues.

In the event of fluid accumulating either in the membrane covering the lung (pleura) or that over the heart (pericardium) such fluid is removed through a needle inserted therein. This fluid is subjected to the usual biochemical and bacteriological examinations to arrive at diagnosis. Factors pertaining to TB can be gauged from such an examination.

In the investigation of disease affecting the membrane covering the brain (TB meningitis) withdrawal of fluid from the back (spine) is one method named lumbar puncture. This fluid is called cerebrospinal fluid; bacilli are detected in it. It helps not only in diagnosis but also in treatment. In the case of affections of kidney, ureters and urinary bladder, examination of urine is the key test. Bacilli are seen under the microscope in the sediment stained after centrifuging the sample of urine; x-ray of kidney, urinary bladder area will throw further light.

Other diseases imitating TB: In these, some or all symptoms pertaining to tuberculous disease are narrated by patients and as such they have to be sieved out in the

diagnostic sieve (this is otherwise called differential diagnosis).

1. *Bronchiectasis:* Patient will be suffering from cough, fever and excessive quantities of foul smelling sputum for some years. The sputum output in 24 hours is very high. Large quantities of sputum are coughed out in the morning after waking. The outpouring of sputum is influenced by posture, large amounts being coughed out in a particular position of the patient, say while lying on his back, on his belly or lying down on one side. The odour of sputum is offensive.

As regards the specific investigation, a rubber tube is passed into the windpipe (trachea) and a milk like medicine (Dionosil) is instilled. Subsequent x-ray photo reveals the ectatic (dilated) areas in the bronchial tubes.

Occasionally bronchiectasis occurs as a sequel to tuberculosis.

2. *Lung abscess:* This is a collection of pus in the lung flesh. Fever and cough are the initial symptoms. Sputum is coughed out in increasing quantities as the abscess matures, the odour of which is very unpleasant and filthy. One cannot stand nearby the patient suffering from lung abscess; the close associates feel disgust. Shivering, chills and sweating characterise toxic state, appetite dwindles and patient exhibits downhill course.

3. *Lung cancer:* This is the most dreadful disease nowadays especially in chronic smokers. Cancer is a cauliflower-like growth in the bronchi or substance of the lung. It is hard

to the feel. It may start with cough and blood streaks due to erosion by the growth. It grows very rapidly, infiltrating and eroding into surrounding structures. One chief symptom is breathlessness which in a short time leads to incapacitation. When the cancer growth occludes the bronchus completely, there is no possibility for air to enter the lung and a state of atelectasis (airlessness in the lung) ensues. The lung gets shrunk; infection is the usual sequel. Abscess may form in the affected portion of the lung.

As the disease advances, progressive inanition occurs leading to what is termed as malignant cachexia (wasting). Blood-containing fluid may get accumulated in the membrane covering the lung (pleura). Change in voice could occur. Breathlessness, difficulty in swallowing ensue. Lymph nodes inside the chest might become enlarged and hard. In addition, extension of the disease could take place into the organs in the abdomen or to brain.

Such suspicious symptoms in an individual over the age of 45 or 50 years, which is the cancer prone age, should prompt the doctor to exclude cancer. No stone is to be left unturned in a thorough check up. The diagnosis of cancer should never be delayed, as otherwise treatment delayed is treatment denied in this dangerous disease.

4. *Pneumonia* is an inflammation of lung. This occurs secondary to infection for e.g. pneumococci, streptococci which are bacilli commonly affecting the lung. It starts as an acute form with fever, pain in chest, cough with rusty sputum, increase in respiratory rate and breathing. About ten day later there is complete subsidence of all symptoms, the individual returning to normalcy provided no complication supervenes.

This pneumonia can be caused by a virus; this virus is so infinitesimal that an electron microscope is required to view it by virtue of higher powers of magnification and resolution of the instrument.

5. *Pulmonary Eosinophilia* is characterised by cough, fever, breathlessness, accompanied by pain in chest and sounds in throat and chest—"gur, gur or szai, szai", otherwise described as catmewing sounds. It is usually mistaken for asthma. Other symptoms are impaired appetite and loss of weight. Under these circumstances it is not uncommon to suspect a wasting disorder like tuberculosis. In pulmonary eosinophilia a type of white blood cells called eosinophils increase in their numbers in the blood. With appropriate treatment, the eosinophils return to their normal number.

6. *Chronic bronchitis*: Cough and sputum occur, for months and years with periodic exacerbations. Fever may accompany the bouts of cough. The episodes gradually worsen as the disease advances, breathlessness to start with is mild but increases in severity with progression of disease. Chronic smoking is a factor aggravating this condition.

7. *Spurious haemoptysis*: A habit of irritating the throat with fingers while cleaning the teeth in early mornings is prevalent in some quarters. Bleeding may occur due to such an act. This should not be mistaken for bleeding from lungs. At times, gums may bleed.

Blood in vomit (haemetemesis) will occur in ulcers of stomach or food tube (oesophagus). Hence when there is blood spit, the confusion whether it is bleeding on coughing or on vomiting, is inevitable. Further watch and investigations unravel the bleeding site.

CHAPTER-VI

Treatment of Tuberculosis.

The crux of the problem of treatment lies in destroying the bacilli. Medicines have to be used with this object in view. If the bacilli are eradicated from the body, not only is he himself protected from disease but the community at large is also protected from spread of infection. Thus the nation's health is safeguarded.

Home treatment of tuberculosis is the watchword today. This is otherwise described as domiciliary treatment. By this, the occupation of the patient in case he/she is the breadwinner, is not disturbed. Earning capacity, supervision of domestic needs and such daily routine are not interfered with. There will be no separation of the wife from the husband and vice versa. If the breadwinner is bedridden in a hospital, the thoughts about his home haunt him; thus not favouring a congenial atmosphere for recovery.

In bygone decades stress was laid on complete rest in bed, over feeding, unvitiated atmosphere, salubrious climate and such bodily comforts. With these goals in view the treatment was planned in a lonely place, a sanatorium. Another strong belief was that excessive quantities of nutritious foods containing eggs, milk, mutton etc. were to be forced into his gullet to effect a cure. That was a phobia.

To clarify the position, it is enough if a well balanced diet proportionate to his bodily needs and giving the requisite energy (calories) is supplied. If he is overfed and made to take rest, obesity develops and subsequent sequelae like diseases of heart and circulation, high blood pressure, breathlessness incapacitate the patient. Hence in the long run his life expectancy will be cut short.

Another practice prevalent in most quarters is to force a patient of TB to swallow raw egg, whether he likes or not. It is to be emphasised that boiled or cooked egg is safe. More over, partaking eggs is not to be considered as a 'must' in the diet in TB.

Under pressing symptoms like fever, sweating, debility, bleeding on coughing, complete rest in bed is essential of course; It is humane and logical to necessarily prescribe rest in bed for such cases. When once these symptoms are overcome, one need not sentence the patient to bed rest. Patient is encouraged to be up and moving about. He need not interrupt his occupation. But the dictum is that he should use medicines regularly, uninterruptedly in the adequate dosages prescribed.

Drugs for TB.

The following medicines are in use:

Streptomycin 1gm. daily I.M. injection i.e. into the muscle, along with Isoniazid 300 mgm. tablet orally once a day. After using these drugs for two or three months, the schedule can be changed to:

(i) Isoniazid 300 mgm plus Thiacetazone 150 mgm. tablets—one tablet per day. This must be taken for 1 ½ years.

(ii) Isoniazid 300 mgm + PAS 10 to 12 gms. (granules or tablets) per day for 1 ½ years.

(iii) Streptomycin I. G. I. M. injection + Isoniazid 650 mgm. twice a week; when the patient comes, one streptomycin injection is given and Isoniazid 650 mgm. tablet is put in his mouth. To express elaborately, the patient attends the clinic say on Mondays and Thursdays (i.e. twice a week) for the above treatment. This must continue for not less than one year, on the average for 1 ½ years. In this schedule there is minimal or no interference to his daily routine and occupation. Furthermore, there is no possibility for skipping off drug inherent in schedules (i) and (ii) since if left to himself, the patient may forget swallowing medicines.

Hence the schedules (i) and (ii) are self-administered regimens; they are dependent on the co-operation and discipline of the patients themselves, since we entrust them with this responsibility.

In states of virulent disease a combination of Streptomycin, Isoniazid and either PAS or Thiacetazone is used for some months. Later Streptomycin is stopped; Isoniazid plus PAS or Isoniazid plus Thiacetazone must be used for 1 ½ years.

At times, these medicines may show side effects showing disagreement with the body, some of them are also called toxic reactions. Under such circumstances, the drugs do not suit his system and do harm rather than good. Change in the medicines is obligatory in that situation.

In the list of medicines given above, streptomycin being an injection requires the assistance of another person say a

doctor, nurse etc., the rest being tablets have ease of administration orally. Injections may be stopped because of pain or because of non-availability of doctor or nurse.

In the District TB Programme tablets are supplied once a month. Drugs should be collected every month. This utterance is easy of narration but difficult to put into practice in actual working situation. Patients use medicines for two or three months and then stop. The symptoms like cough, fever, debility abate in a few weeks after the commencement of drugs, appetite returns and sensation of well-being is restored. Such amelioration in symptoms should not be equated to cure of the disease and treatment stopped prematurely. Strictly speaking, medicines ought to be continued for about six months after the disappearance of bacilli in sputum.

When once the treatment is started, it should be gone through in an uninterrupted manner and in a disciplined fashion. Non-interruption in drug intake is influenced by the availability of such medicines to the patients. With this object in view, free treatment facility is available in Government hospitals and in District TB Programme. This will obviate drug default in such of those who cannot afford to purchase. When regularity in treatment is interrupted, the tubercle bacilli become adamant and develop resistance to the drugs, a situation wherein the bacilli are no longer killed. Under such circumstances newer drugs have to be used. They are Ethionamide, Pyrazinamide, Cycloserine, Ethambutol and Rifampicin; these are costly.

Hence when once treatment is contemplated, the nature of the disease must be detailed to the patient and it is to be emphasised that the treatment should cover a period of 1 ½

years. This sermon to the patient preached by a doctor or health visitor is called 'motivation'. Next, a treatment card is prepared on the patient's name; details about his illness are recorded. On the reverse, medicines given with date are noted. The date of next visit exactly a month later is indicated, at which time his presence is awaited. If he comes, well and good. In the event of default, a postal reminder is sent. Health visitors go to the houses of such defaulters to remind them. Another method is to take help from neighbours, village chiefs or officers and philanthropic individuals to see that the patient attends for collection of medicines regularly.

The patient may collect the medicines but not swallow. To verify this, a surprise check is made to count the pills remaining in the quota supplied; an assessment of this will help to come to a conclusion. Still, this is not fool-proof since some patients may throw away tablets outside thus defying disciplined drug intake. If he utters a lie that he has swallowed, trial is made to detect the drug in urine. While any drug is being administered, it gets absorbed into blood and is excreted in urine. Hence if this examination is done, it will be clarified whether the statement of the patient is true or not.

The patient may skip off the medicine due to forgetfulness or carelessness. An intolerable toxicity or other side effects, prompt him to stop the drugs for example, impairment of appetite, abdominal pain, giddiness, biliousness, nausea or vomiting etc. If these are brought to the notice of doctors, the medicines will be either changed or further drugs prescribed to combat these side effects.

P A S is a medicine dispensed as red or chocolate coloured granules. On swallowing this, acid gastric juice is

increased and hyperacidity is produced, burning in the abdomen, loss in appetite ensue. If the drug is stopped, a problem is created for the patient viz. development of resistance to the companion drug isoniazid in case the patient has been put on a combination of P A S plus isoniazid; virtually the patient has been taking isoniazid alone. The bacilli are no longer killed. The object of treatment is defeated. Such a contingency must be averted.

Medicines and facilities have been kept within the reach of patients in the District TB Programme. In the villages they are available in the primary health centre, or local fund dispensary. In cities, domiciliary treatment clinics have been established in different localities. Patients choose the clinic of their choice, preferably nearer their homes, get their names enrolled and get treated uninterruptedly.

Periodic check up of sputum for bacilli should be continued during the treatment. If bacillary destruction is not achieved in spite of regular administration of drugs, it is a pointer that the drugs so far employed have not been the ideal ones, in that particular case. Perhaps, the drugs have to be changed. Matters of this sort are better decided by doctors.

If the disease had not been amenable to drugs and/or fibrosis has bridged the lung tissue, the destroyed portion of lung is removed by operation. In the event of a cavity persisting for some years in the x-ray, and the lung in that portion getting shrunk, such patients are also fit for surgery. The removal of one lung is called pneumonectomy, while resection of a part of it is termed lobectomy.

Methods of treatment vary with the organ involved.

The above medicines are essential whichever organ is affected.

In cases of accumulation of fluid in the membrane covering the lungs or heart another medicine called 'corticosteroid' is used along with antitubercular drugs; this medicine helps in quicker absorption of the fluid and lessens further formation of the same. Corticosteroids are employed in TB meningitis and miliary TB also.

Side effects of Drugs

The following side effects are likely to be encountered in the administration of these drugs.

Streptomycin: During the first four weeks rash over the body, itching, fever and headache, numbness around the mouth, flushing over the face and body, joint pains are the side effects experienced by patients. After two or three months giddiness, reeling sensation, inability to walk along a straight line without falling to either side may be reported.

Isoniazid: Nausea, vomiting in the early days, later sensation of numbness and burning in extremities; Pyridoxin is the remedy for the latter side effect. In children fits may occur if the dosage is exceeded; in adults psychoses develop in susceptible individuals.

PAS: Symptoms pertaining to abdomen like nausea, vomiting, pain in abdomen, diarrhoea are features of disagreement of the body. If its use is still persisted, liver enlargement, jaundice and thyroid gland enlargement could occur. Blood cell disorder may threaten one, rarely.

Thiacetazone: Nausea, vomiting, headache, giddiness, rash over the body, soreness of lips, mouth and eyes, jaundice and liver enlargement. A fatal form of blistering of skin and mucous membranes is sometimes encountered. If any of the above mentioned side effects are noticed, the drug should be stopped forthwith and doctor should be consulted.

Ethionamide: During the first 2 to 3 weeks pain abdomen, nausea, vomiting may occur. After 4 weeks acne on the face and body, falling of scalp hair may be noticed.

Pyrazinamide: Joint pains confined to either small or big joints, nausea, vomiting, liver enlargement, jaundice are the common side effects.

Cycloserine: Nervous debility, psychiatric disturbances and suicidal tendencies. Hence this should not be prescribed to those patients with an unstable nervous system.

Ethambutol: In exceptional cases pain abdomen, vomiting, symptoms pertaining to vision and pain behind eye balls may be encountered. These are fully reversible; that is to say, when once the drug is withdrawn, normalcy is restored.

Rifampicin: Is a very good medicine but it is costly. Hence it is not within the reach of the common man. One should be on the lookout for liver enlargement and jaundice after starting this drug.

Measures to discipline cough

If the output of sputum is not much, the cough is better suppressed. Elementary methods like wetting the throat

with water, sucking a sugar cube or crystals, using spices like cardamom, cloves and thus wetting the throat go a long way in the control of dry cough. Cheap cough lozenges e.g. peps, Dequadin throat lozenges etc. are easily available in the market and benefit could be obtained from keeping them in mouth. There are several cough mixtures for appropriate use. Cough is a reflex comparable to itching. The more one indulges in scratching over itching skin the greater the inclination to scratch further. On the other hand, if restraint is adopted by will power right from the beginning and not commencing to scratch, the itching may subside. In the same way too, cough should be restrained. As one begins to cough more and more, throat gets dried up and further irritation of throat results in cough. This situation is observed in the attempt to ward off cough by wetting the throat with water in a glass tumbler kept on the table near a person delivering a lecture.

In case the cough is associated with lot of sputum (productive cough), it is unwise to stop it; logic tells us that this manoeuvre of cough is an attempt on the part of the lung to throw out the destroyed lung substance and secretions. Hence under such circumstances, the patient should be instructed to cough out the offending material.

Cough is the watch dog of the respiratory tree. When secretions are present cough brings them out. Cough is like a 'talisman' to the tracheobronchial tree.

Cough can set right or worsen a situation. It can help and save the tissues from irritation if unnecessary cough is controlled; if not, discomfort and extension of disease are likely. Hence he should neither underindulge nor overindulge in this mechanism of cough; he should modify according to the disease he is suffering from, as outlined above.

Bleeding on coughing :

It is an expected and established fact that a patient is scared at the sight of blood in his cough. Hence reassurance and giving courage to the patient go a long way in winning his confidence. Majority of cases set right themselves, the blood subsides automatically. Injection 'Calmpose' is given to calm apprehension; if no relief is obtained, injection Pethidine hydrochloride is administered. There are other medicines to stop such bleeding. Blood transfusion is given, if necessary.

Under these circumstances of bleeding the patient is instructed not to eat hot food products or drink hot beverages, since this may aggravate the bleeding. Cool drinks are to be given. Ice pieces are to be sucked. Cough should be disciplined. forcible cough favours recurrence of bleeding from lungs. In case the blood is tending to get clotted, such clots should be coughed with an optimal non-invasive force, as otherwise these clots may obstruct air passages leading to suffocation and death. The nurse usually gives first aid by turning the patient's head to one side and dislodging the clots from the throat, thus insuring a patent airway.

DIABETES MELLITUS AND PULMONARY TB

Diabetes mellitus is a disease characterised by passage of sugar in urine, increased quantity of urine passed each time and increased thirst and appetite. Diabetes and pulmonary tuberculosis are twin evils, which one could suffer from. Both are wasting diseases. In the presence of one the other flares up. If a diabetic suffers from cough and fever for more than three to four weeks, which is not controlled with ordinary medicines and if his dose of insulin requirement is being increased, one possibility is that there is an associated pulmonary TB; vice versa if TB is not getting arrested with the best

regimen, there may be a possibility of associated diabetes mellitus. In a patient suffering from both the diseases, the tuberculosis is easily tackled if diabetes is kept under control. Patient might not be aware of the coincident diabetes mellitus, since general debility, dragging pains in limbs, fatigue and exhaustion may occur in either disease. In the age group above 40 or 45 any one of these two diseases might occur with greater frequency; both may coexist, as mentioned earlier.

TREATMENT

A patient suffering from both diabetes mellitus and pulmonary TB must observe the following principles :

Diet: A patient suffering from diabetes alone (i. e. not associated with Pulmonary TB) must reduce his weight by eating less if he is obese, whereas he must increase his weight by eating more if he is underweight. But a person suffering from both the diseases must not reduce his energy supplying calories. He must eat to satisfy his hunger and control the diabetic state with drugs.

The following is the pattern of food recommended in a diabetic (Table I)

Food articles	TABLE 1	
	in grams	calories i.e. measure of energy
Carbohydrates		
Rice, Wheat, Jowar, Ragi.	250	1,000
Proteins		
All varieties of dhalls	120	480
Bengal gram, green gram, black gram tuwar dhal.		
Fats.		
Ghee, Oil.	40	360
		<hr/> 1,840 <hr/>

There are certain misconceptions about the type of food to be taken by the diabetic. Once the diagnosis of diabetes mellitus is established, rice is replaced by wheat as a staple diet; some replace rice by jowar or ragi. The result is under-nutrition due to nonacclimatisation of such unaccustomed principal food. There is no need for such a change. They can partake the same type of cereal to which they were habituated prior to onset of diabetes. Rice eaters need not change to wheat, jowar or ragi.

The following table reveals that all the cereals contain the principal ingredients to the same percentage almost, with only marginal differences:

TABLE II

Cereal	grammes per ounce		
	Carbohydrate	Protein	Fat.
Rice.	— 22	2.4	0.2
Wheat.	— 20.2	3.4	0.4
Ragi.	— 21.7	2.0	0.4

Amongst dhalls, black gram is ideal. Ricecakes (so called idlies) prepared from a mixture of black gram 70 to 80% and rice 30 to 20% is an ideal food for diabetics. Since they are cooked on steam they are digested easily. In the idlies prepared in hotels the content of rice is more. Even then, such idlies may be preferred. Diabetics can take any quantity of idlies to satiate their hunger. This food will fill in the belly and furnish the required energy. Fried cakes with black gram (vada) may be taken but they are not easily digested since they are fried in oil. Not as many vadas as

the number of idlies can be consumed. Other dhalls are also equally nutritious.

Amongst the fats, refined oil e.g. Vanaspati is to be preferred

It is better to reduce the quantity of mutton. Chicken and fish are to be preferred to eggs and mutton. Milk, coffee, tea and other beverages are to be taken without sugar.

The daily allowance is better divided into four or five parts and eaten (say morning, mid morning, lunch, evening and night)

The following articles are to be avoided by a diabetic: Sugar, sweets, jaggery, icecreams, chocolates, grapes, mangoes, honey. Tubers e.g. potato are better restricted.

Such of those articles which can be taken in plenty: Leafy vegetables, greens like bitter gourd, snake gourd, brinjals, cucumber, ladies fingers, tomatoes, cabbage.

What has to be grasped on the whole is to see that a person suffering from diabetes mellitus and pulmonary TB should not starve himself. Restriction of diet leading to emaciation should not be practised. Food is eaten full to the belly and the sugar in urine must be controlled with Insulin injections. After a certain period of injection treatment, oral medicines can be substituted for the treatment of diabetes too.

It is not uncommon to observe that patients do not accept Insulin injections in addition to the already prescribed streptomycin injections. Hence, after the severity of diabetes is lessened, switching over to tablets is a welcome sigh of relief! furthermore, similar approach in treatment schedule with oral drugs for tuberculosis can be adopted.

CHAPTER-VII

Control of Tuberculosis

In the control of TB and measures to check spread of the disease one should think not only of factors pertaining to the bacilli but also about the resistance. Socioeconomic factors should improve. The index of living standards should increase. Adequately ventilated surroundings, fresh breeze is conducive to maintenance of respiratory hygiene. Housing, water supply and drainage facilities have to be provided in a fit manner. Air pollution is a menace to the health of the community. Observance of the above health rules is as important in the control of TB as it is in other communicable diseases.

If the power to resist disease is enhanced in the body and sufficient strength is acquired to overcome bacillary invasion, the body conquers the bacilli in the fight against the disease. Health is a balance between two pans, with body resistance on one side and the infection on the other (Fig. 7). The tilt of the balance will be to that side on which the forces are predominating. To keep the tilt of the balance on the side of body resistance, is the key to health insurance.

Housing facilities

There must be adequate ventilation in a house, however small it might be. Breeze and light can be improvised by necessary alterations in the already constructed houses.

Municipality should accord sanction to future constructions in accordance with the rules and stipulations of Housing Board.

It is usual to observe single room abodes in villages. This will serve as bed room, kitchen, living room - all in one, to carry on the daily routine. In such a situation, common latrines and drainage systems are to be provided.

Protected water supply is absolutely essential in every village. This is one of the basic health needs in a community.

Nutrition Balanced diet implies sufficiently nutritious food commensurate to the requirements of the body. Food is not valued in terms of quantity alone but quality of the food-stuffs viz. carbohydrates which are energy giving substances, proteins which are body building entities and fats which are tasteful essentials. Carbohydrates are contained in cereals like rice, jowar, wheat, ragi etc. Proteins are present in dhalls, milk, mutton, eggs, fish etc. Oils and ghee comprise of fats. Adequate nutrition does not necessarily imply costly items in menu; inclusion of cheap substitutes like groundnuts, banana, jaggery, dhalls etc., do help. Along with these, fresh green and leafy vegetables enhance the food value. Since these are available in plenty in villages, it is a boon for health.

It is often observed that even the well-to-do may not partake a well balanced diet, the reason being not that they cannot afford but due to lack of sufficient knowledge. Thus the key to maintenance of body resistance at a high level, lies in partaking a balanced diet so as to keep the defence forces of the body strong.

After the advent of the Five Year plans, living facilities are made available at the village level. Electricity, rural water supply, drainage facilities including flush cistern latrines rank amongst the essential requisites at the village level. Drainage systems connecting to septic tanks are to be provided. Such pilot projects are being undertaken in the Five Year plan.

Health rules have to be observed in municipalities, panchayat units etc. to quote an instance, preparation and preservation of eatables and their sale. At the outset, the eatables must be prepared with unadulterated raw material, covering the prepared materials with a wire mesh thus protecting them from fly menace, exhibiting them behind glass doors and such protective measures go a long way in the ultimate prevention of infectious diseases.

Countrywise, tuberculosis has been separated from the mainstream of diseases; an independent status is given to this disease with an Adviser in Tuberculosis functioning at the centre. Courses pertaining to the teaching and training in the speciality - D.T.C.D. Course (Diploma in TB & Chest Diseases) have been instituted in various Universities. Tuberculosis Associations arrange lectures and refresher courses for general practitioners and other doctors; health visitors are trained for this specific work of educating, in turn, the masses. Such beneficial projects for the masses are envisaged.

TB Demonstration and training centres have been established in all the capital cities in the states in our country for example, Hyderabad in Andhra Pradesh, Madras in Tamil Nadu. One institute in Bangalore has been established on a national level called National TB Institute (N.T.I.) Bangalore,

where the teams to run the State TB centres are given the necessary training.

In previous times, all the tuberculous patients were scheduled to be admitted in hospitals for treatment. To fulfill such a desire there must be enough beds in hospitals. It is associated with lot of expenditure; further, manpower is needed for supervision and management. The country's economy and budget could ill afford such an unforeseen expenditure. Hence thought was bestowed as to how best this disease could be brought under control. In careful controlled studies, it was established that organised home treatment (domiciliary treatment) was in no way inferior to hospital treatment. Equal success is achieved either in home treatment or in hospitalisation. Home treatment is as safe as hospital treatment. Basing on these observations, the District TB Programme was envisaged. Every patient in the village is looked after through the network of this programme; there is opportunity for every citizen to be vaccinated with B.C.G.

The cost of diagnosing a case by x-ray examination (mass radiography) is around Rs. 500/- according to blue print published by TB Association of India, 1975, whereas sputum examination is far, far cheaper and easy. Hence if sputum examination is conducted for all patients exhibiting symptoms of tuberculosis, it amounts to doing service to more number of patients.

It has already been mentioned that the teams for control of tuberculosis are being trained in N.T.I., Bangalore. So far, 298 District TB Centres have been established. People should come to know that such facilities exist for patients and the latter must utilise them. There should be a firm determination to control the disease. Misconceptions about

the disease must end. The principles of NTP should be put in vogue. Only when people feel themselves shareholders in this venture viz that of control of tuberculosis, will NTP become a success.

Family planning is a useful adjunct to the measures to control TB. When the patient adopts family planning, he is saved from the further problems in the wake of this disease.

The following facets in TB Programmes are to be highlighted.

B. C. G. Vaccination

B.C.G. vaccine contains living attenuated bovine bacilli. It is by definition, *Bacillus Calmette and Guérin*, after the inventors. B.C.G. constitutes an ideal method of personal prophylaxis against TB. It confers a state of relative protection from risk of development of disease.

B.C.G. vaccination is one way of ultimate control of the disease. Every baby born must be vaccinated soon after birth. If possible, a second vaccination at the time of school leaving should be arranged. If vaccination has not been done after birth, it may be done at the time of school entry; door to door vaccination is being carried on in villages for such groups.

Around 190 million people have been vaccinated with B.C.G. so far in our country.

In the present day, all individuals below the age of 15 years in cities and 20 years in villages are being routinely vaccinated with B.C.G. without prior tuberculin testing; this is termed otherwise, direct vaccination.

Simultaneous vaccination with B.C.G. on one hand and small pox on the other could be arranged at one sitting. This obviates the need for two visits to the health centre. Small pox vaccinators are being trained in B.C.G. vaccination too. The family planning personnel also could be co-opted for this B.C.G. work. There are facilities for such vaccination in Maternity & Child Welfare Centres. Gradually tuberculosis preventive measures are being integrated into the General Health Services. The workers at the periphery (village health workers or basic health workers) are supplied with information to communicate to the masses about the particulars of this disease. Health education is a part of their curriculum during their training period.

Health education: There is an awareness and appreciation now in the masses about the problems in tuberculosis. Traditional misconceptions and unwarranted disbeliefs in the production and causation of the disease are waning off, but have not yet completely vanished from the minds of people. If the patient takes the prescribed medicines regularly in a disciplined fashion, the disease can be completely cured. The patient should consult the doctor at the earliest and slightest suspicious symptoms already enumerated in chapter 4.

Those seeking employment in factories, schools, government services or private companies, vendors selling eatables, servers and cooks in hotels, barbers etc., must be checked up before being fixed up in the jobs; such of those found fit only must be chosen; in addition, periodic check-up is advisable. This procedure is safe for themselves as well as to the nation,

Tuberculosis Associations can do yeoman services by circulating pamphlets, leaflets and giving newspaper publications about this disease, thus making the masses aware of

the problems. Health education must be imparted by wall posters, cinema slides etc.

The TB Seal

In the TB Seal we have a glimpse of our determination to conquer the scourge of tuberculosis. It conveys the message that TB, a public health enemy No. 1 should be tackled on a voluntary basis, its victims diagnosed early and treated effectively, thus restoring them to normal health. Any activity of a voluntary organisation will permeate the mind of the masses if it is a willing voluntary contribution rather than by compulsion as not to pinch his pocket. This could be achieved by confining the contribution to the minimum denomination, of coinage. With this idea the seal has been priced at ten naya paise. The mighty strength of a tiny seal is revealed by its potentialities when the funds raised by such a campaign provide rich capital for the activities of TB Associations.

The story of the TB Seal started in 1904 with a historical episode when Einar Holboell, a Danish postmaster seeing the sight of pathetic children with tuberculosis of bones limping across the roads, got infused with an idea that if each postal article were to carry a facsimile of a tuberculosis problem, the national fervour would reach such a height as to make each and every one contribute his mite.

Countries like the U.K., the U.S.A., Australia, Japan etc., adopted this idea, some of such seals are seen in pictures herein.



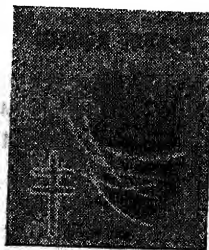
U. S. A.



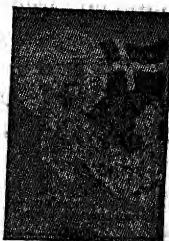
Great Britain



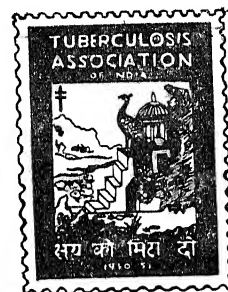
South Africa



Japan



France



1950



1951



1952



1953



1954



1955



1956



1957



1958



1959



1960



1961



1962



1963



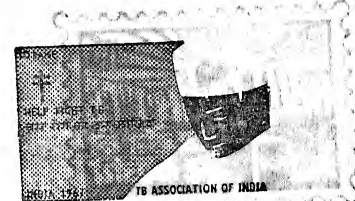
1964



1965



1966



1967



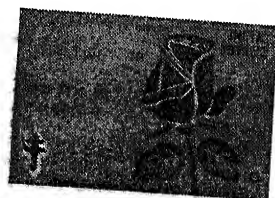
1968



1969



1970



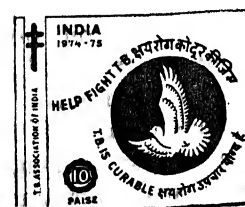
1971



1972



1973



1974

The TB Seal campaign in India took genesis in the year 1944 on a proposal from the Duchess of Portland. The first nation wide TB Seal sale campaign was started in India in the year 1950. This commences on October 2, Gandhiji's birthday and closes on January 26, the next year, the Republic day. The accompanying pictures of the seals impress upon ones mind the impact each seal has created in the individual. Events in the life in the country have been chosen to be depicted, so that an irresistible psychological appeal is implied in each and the campaign viewed on a national platform.

Precautions

Following are the precautions to be adopted by a patient of tuberculosis to avoid spread of infection to others:

1. To cover the mouth with a cloth at the time of coughing and turn the face to one side so as to avoid contamination of his surroundings with the droplets in sputum containing innumerable bacilli (Fig. 8). Healthy people are affected by this bacilli-laden atmosphere; children are particularly prone to catch infection easily.

2. To use a sputum cup (a container) into which sputum is coughed out, for example, an aluminium one or a cigarette

tin with a properly fitting lid. Some quantity of phenyle is placed in the container and the patient should spit over that layer of phenyle. After accumulation for 24 hours the contents of the container are boiled and the scum buried underneath the soil to a depth of two feet. The method of sterilisation of the sputum cup is by boiling it in water. There should be a twin set of sputum cups always, one in use, the other in the process of sterilisation. If such a set up is not arranged, the patient will spit out or swallow sputum when the only one available cup is sent for washing and drying.

3. Sputum should not be deposited indiscriminately. It is not uncommon to observe sputum-stained red marks spat after betel leaf chewing glow with fluorescence by the 'katha in pan'. These marks are seen on roads, cinema houses, hotels, railway stations, bus stands and such public thoroughfare areas. One observes very often yellowish or greenish sputum glistening in the above areas. This is highly injurious to public health. The bacilli in sputum get dried up and float in the dust-laden atmosphere, they thrive well and keep themselves alive for long periods in the dust. Dry dust is more harmful than wet sputum. Healthy individuals, chiefly children, get infected from this source. Hence legislation should be enforced to see that spitting in public places is prohibited. Such a precaution has to be borne in mind while tackling not only tuberculosis but other infections spreading through sputum droplets; moreover, this applies not only to tuberculous patient but to every citizen.

4. Kissing infants and children or coughing with an unguarded mouth over them is prohibited since these are easily affected by this infection at such a tender age.

5. Procedure to clean the bed room: phenyle lotion should first be sprinkled on the floor and swabbed. Next the dust must be swept off with a broom. If the dry floor is swept with a broom, the bacilli-laden dust will be made to float in air; the particles containing bacilli thus suspended in air are injurious in view of the fact that they are infectious.

6. Patients whose sputum is bacilli-laden are discouraged from mixing themselves in congregations, fairs and such crowded surroundings.

7. Flies are common carriers of infection; they spread disease through contamination by prior sitting on infected sputum. To arrest this spread, indiscriminate spitting should be avoided. Measures to ward off flies from entering inside by provision of fly-proof mesh to doors and windows, are desirable.

The above mentioned precautions are measures to be adopted to avoid spread of disease from one person to another.

Those patients suffering from lung tuberculosis should not swallow their sputum, for in such a case organs like larynx and intestines may be affected.

One notorious feature of this disease is a tendency to relapse. Hence the general resistance of the body should be maintained at a high level, so as to ward off any further reactivation of the old process.

National TB Programme:—

Urban Programme. Till now tuberculosis hospitals were established in few cities only; not all towns were covered. The situation has to be analysed to provide facilities to all city

and town dwellers. TB Clinics should be organised at the rate of one clinic per one lakh population. If the population to be covered is 5 lakhs, the undertaking should be on a wider scale which includes x-ray examination of all individuals in their houses; in those with disease, steps should be taken to cure them and thus prevent further spread.

Since birth registers are maintained in municipalities, it is feasible to vaccinate with B.C.G. every child born in that jurisdiction; the second vaccination could conveniently be arranged at school leaving period. Small-pox vaccinators, auxiliary nurse & midwives (ANMs) and nurses are better given training in B.C.G. vaccination.

Drug supply centres must be established in various places in the city, thus covering all localities. Facilities for monthly drug distribution should be made available.

Rural Programme. The District TB Centre occupies a pivotal position in the National TB Programme. Prompt and early diagnosis, further investigations in suspect cases and such other activities are undertaken in the district centres. The cases referred from general practitioners are returned to them after giving the necessary advice.

When the bacilli are detected in the sputum, treatment is started straight away at the village level itself. In those cases where bacilli are not found, further investigations like x-ray chest are arranged for in the District TB Centre or nearest taluqa hospital. The disease is certified after x-ray result.

District TB Centre functions as an advisory body for all other types of centres (usually called peripheral health institutions or centres). All the patients in the entire district are indexed in a register and relevant statistics are maintained.

Each district hospital should be equipped with a minimum of 10 beds for TB patients. Microscopes should be provided in all service facilities at village level viz. primary health centre (P.H.C.) local fund dispensary etc., for sputum examination.

Taluk hospitals must be provided with facilities for x-ray examination; this helps in diagnosis of other ailments besides TB.

The anti-TB drugs have to be administered for a minimum period of one year. After one year of treatment, if the sputum is still positive the case must be transferred to District TB Centre. When the disease has cleared in the x-ray picture after 18 to 24 months of treatment, the treatment can be stopped.

Preparation of an index card for each patient, maintenance of a case register of all patients in the district are the prime duties of a District Centre. The cards of patients who have completed the course of treatment are preserved for 5 years; this enables one to trace out the patient in case of a relapse in TB.

Health Education regarding this disease must be imparted to basic health workers, village level workers, sanitary assistants etc. In addition, the general practitioners must be given refresher knowledge about the changing trends in the epidemiology, treatment and prevention of tuberculosis.

In the treatment section, the record to the effect that the patient is collecting drugs regularly every month, is maintained. If he becomes a defaulter, the health visitor goes to the house of the patient for retrieval.

From the experience of workers in the field, the following two conclusions have been arrived at:-

1. Amongst those patients exhibiting the symptoms of this disease, sputum examination for bacilli will detect nearly 85% of cases.

2 It was established that 95% of sputum bacillary positive patients were aware of one or more symptoms pertaining to this disease; these symptoms are detailed in 4th chapter.

Chemoprophylaxis.

As the name indicates, this is a prophylactic treatment with an antitubercular drug isoniazid, in the following groups of individuals:

- i) Children below 3 years, if found to be tuberculin positive.
- ii) Young tuberculin positive contacts of open cases viz. those excreting bacilli.
- iii) hyperreactors to tuberculin.

Notification. Pulmonary tuberculosis must be made a notifiable disease, on par with other such ones like small-pox, cholera etc.

ERRATA

	instead of	read as
Chapter II		
P. 10 3rd para 1st sentence	soil	soil factors
P. 16 last para 3rd sentence	which it	which is
P. 17 2nd para 1st sentence	the above	the above mentioned
Chapter III		
P.21 2nd para 4th sentence	is comparable to Fibrosis	Fibrosis is comparable to
P. 23 2nd subheading	Millary tuberculosis	Miliary tuberculosis
P. 24 last para 3rd sentence from beneath	what is know	what is known
P. 27 2nd para 3rd sentence	bone (narrow)	bone (marrow)
P. 29 1st para 2nd sentence	sight to children	sight to see children
Chapter VI		
P. 48 last para last sentence	was a phobia	was due to a phobia
P. 60 4th para last sentence	honey, tubers e.g.	honey. Tubers e.g.
Chapter VII		
1st para 3rd sentence	about the resistance	about the body resistance